

CHAPTER 1

INTRODUCTION

Measurements of atmospheric parameters are a first step toward understanding atmospheric dynamics, and the ability to make weather and climate predictions. Introduction of the radiosonde and subsequent improvements in our weather forecasts testify to the validity of this observation. With a network of nearly 800 radiosonde stations worldwide, the twice-per-day manually launched radiosonde has become the standard source for upper air data. This network's temporal resolution is sufficient for large scales; however, our increased awareness of the importance of smaller scales and our desire for greater resolutions has led to the need for continuous data from automated systems. This issue is being addressed on many fronts, including new analysis techniques, automated balloon launchers, in-flight aircraft data, and a variety of remote sensing techniques that can be employed from the surface and on air- or space-based platforms. This review reports on one of these techniques: the surface-based radar wind profiler. Where appropriate, we will also mention the Radio Acoustic Sounding System (RASS) (May et al. 1989; Strauch et al. 1989; Moran et al. 1991; Masuda and Nakamura 1994), which uses an acoustic source in conjunction with the wind profiler to measure virtual temperature profiles.

This review covers wind profiling activity only in the United States. Progress in other countries has been equally impressive, and should be referred to for a worldwide view of the field. The review opens with a discussion of wind profiler theory, instrument characteristics and limitations, and some ideas on possible improvements. This discussion is followed by a brief development history, examples of the profiler's widespread use, and some ideas on new avenues of research that are now possible using profiler technology. The intent is to provide an overview that highlights important points, with ample references for the reader who desires more detail.